

Digital Over-current Relay with Ammeter

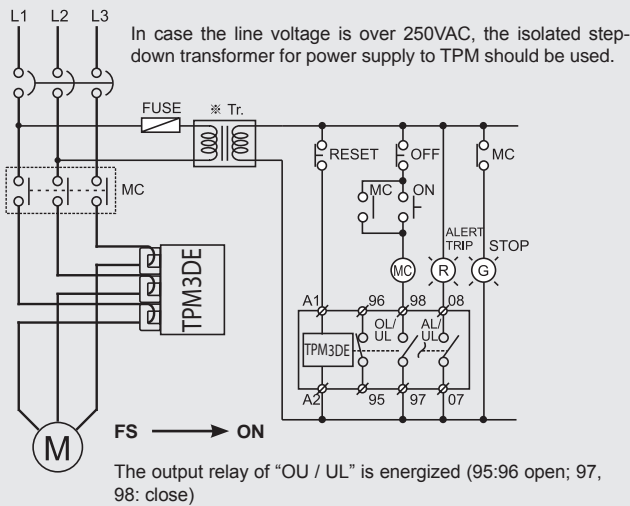
TPM-3DE

Description

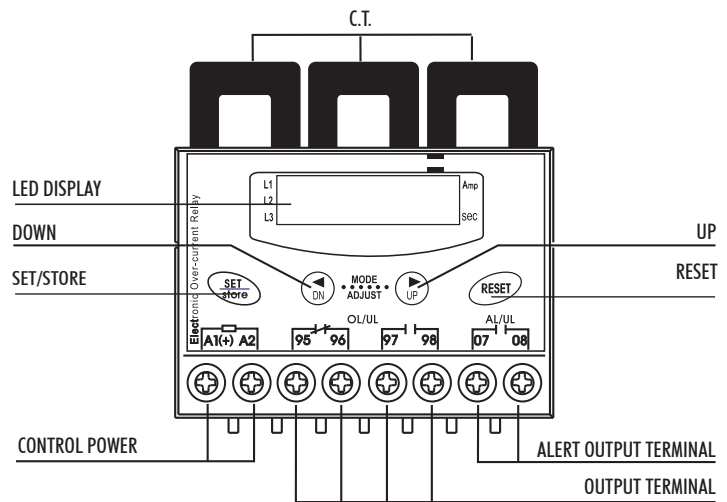
- MCU(Micro Controller Unit) based.
- Ampere meter function . Load current of 3 phases are displayed in sequence and display time of each phase current is 5 sec.
- Overcurrent protection range:
 - 0.5~60A(wide range type) : displays line current under 100A.
 - 11...960 A: with external CT.
- Undercurrent protection range. 0.5A~less than "oc" setting value /OFF(- -).
- Time-Current characteristics.
 - 0.5...10 A: Definite/Inverse, selectable.
 - More or equal than 11A: definite(if inverse required, use with external CT).
- Easy troubleshooting by 7 segment LED.
- Trip output of UL : This output is normally shared with OC, but in case "AL" mode is selected into "U", then "AL" Output (07-| |—08) is transferred into "UL" output.
- Trip cause memory : Last 3 trip, stored regardless power failure.
- Reset : manual(instantaneous)/electrical(remote).
- Fail safe(self-diagnostics) : The output relay of "OL" is energized when control power applied.
- Applicable to Inverter(20~400Hz).



Typical Application Diagram



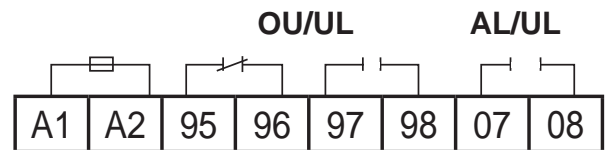
Frontal configuration



Function and Indication of Alert

Progr. "Alto" / En marcha	Normal	Mayor que la alerta programada / (%)	Disparo
"F" parpadeo	██████████		
"H" mantener		██████████	
"A" aux.	██████████		

E/S7 Terminals Configuration



Function feature

Protected Item	Operation Delay
Overcurrent	0,5 / 1~30 sec (Definite Time Type) 1~30 class (Inverse time type)
Undercurrent	1~30 sec (Definite Time Type)
Phase Loss	Within 3 sec.
Phase Reversal	0,1 sec.
Unbalance	Within 8 sec.
Locked Rotor	Trip after preset 'dt'
Stall	1...10 sec.

How to setup

1) Current:






- **Definite time** – Set the rated motor current in "OC" mode. For protection of connected machinery with motor, it is recommended to set the 10~115% of running current after motor current is stabilized.
- **Inverse time** – 100% of rated motor current or 110~125% actual motor current is recommended.

2) D-Time: Set the expected run-up time of motor in "dt" mode.

3) O-Time :

- **Definite Time** – Set the desired trip delay time in "ot" mode.
- **Inverse Time** – Set the trip delay time according to Time-Current characteristics.

How to set

Mode		Search a mode to be adjusted by depressing UP/DN mode switch.
Set		Selected mode and setting value start flickering which means to be ready to accept setting as depressing once a Set/store button.
Adjust		Select a required setting value and/or characters by depressing continuously UP/DN mode switch until reaching what want to do.
Store		Store a selected value and/or characters by depressing once Set/store button. Instantaneously the flickering is stopped.
Reset		After completing above procedure, make a reset to be ready to operate. If not made reset, it will be reset automatically after an elapse of 30 sec.
Current rotation by Manual		Instead of automatic rotation, manual display rotation is possible as depressing once SET/ Store button during an operation. If manual is selected, the information of phase current L1 is displayed firstly and next information is displayed continuously like a manner of: L1→L2→L3→GF→L1→....
How to check trip cause		<ul style="list-style-type: none"> • Enter into "trip" mode by depressing once Set/store button, then last trip cause is showed. • Each phase current is displayed in order whenever depress UP/DN button in every once. • The 2nd trip cause is showed after displaying 3 phase current of last trip. • The 3rd trip can be checked by same manner.

Size

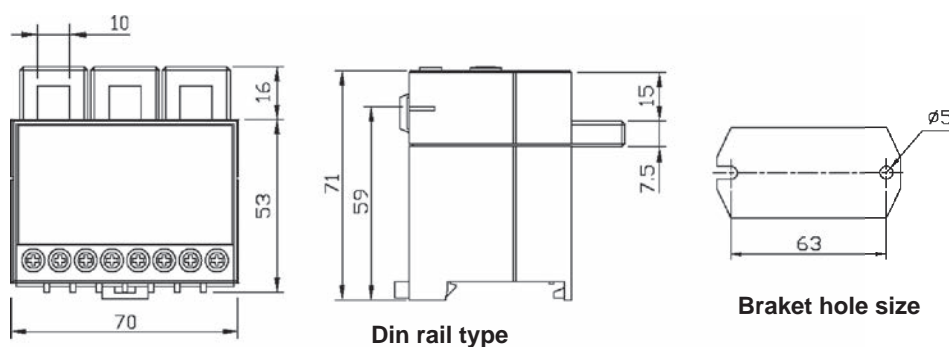


Table 1

Current setting range (A.)	Number of conductors through CT	External CT Ratio	Setting of CT Ratio	Remark
0.5...60A	1	-	OFF	Wide Range
0.25...3.0A	2	-	2t	
0.1...1.2A	5	-	5t	
1...12A	1	10:5	10	
1.5...18A	1	15:5	15	
2.0...24A	1	20:5	20	
2.5...30A	1	25:5	25	
3.0...36A	1	30:5	30	
4.0...48A	1	40:5	40	
5...60A	1	50:5	50	
6...72A	1	60:5	60	
7.5...90A	1	75:5	75	
10...120A	1	100:5	100	
12...144A	1	120:5	120	
15...180A	1	150:5	150	
20...240A	1	200:5	200	
25...300A	1	250:5	250	
30...360A	1	300:5	300	
40...480A	1	400:5	400	
50...600A	1	500:5	500	
60...720A	1	600:5	600	
75...900A	1	750:5	750	
80...960A	1	800:5	800	

Table 2. OC adjustable time features

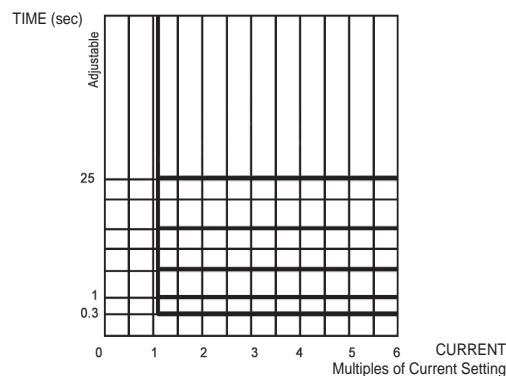
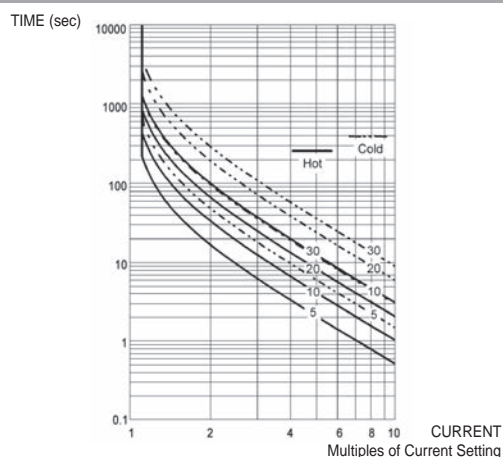

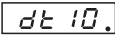
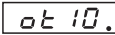
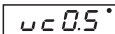
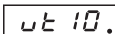
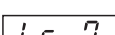

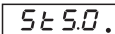
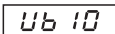


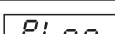
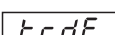
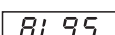
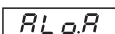
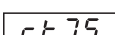
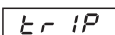
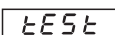
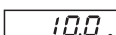



Table 3. OC inverse time features 0.5...10A / combined with external transformer



Display Setting

Function	Setting Range	FND Display	Description
Over-current	0.5 A...60 A		<ul style="list-style-type: none"> 0.5...10 A: 0.1 A steps. 10...60 A: 1 A steps. Not possible to set a current value over 10A if inverse characteristics is selected. To set at first a preset protected value(<6A) based on CT secondary output before setting a CT ratio if needed to adopt external CT instead of wide range["CT":OFF(--)].
Starting Delay Time	1...200 sec. / OFF (dt--)		<ul style="list-style-type: none"> 1...100 sec.: 1 sec. steps. 100...200 sec.: 10 sec. steps.
Over-current Trip Delay Time	<ul style="list-style-type: none"> 1...30 sec. (definite time). 1...30 class (inverse) 		<ul style="list-style-type: none"> 0.5 sec. / 1...30 sec.: 1sec. steps. Operated after "Starting Delay Time".
Under-current	0.5A~less than "oc" setting value / OFF(uc--)		<ul style="list-style-type: none"> Not possible to set over "over-current set-value("oc)". 0.5, 1...10 A: 0.1 A steps. 10 A: 1 A steps.
Under-current Trip Delay Time	1...30 sec.		<ul style="list-style-type: none"> 0.5 sec. / 1...30 sec.: 1sec. steps Operated after "Starting Delay Time".
Locked Rotor	<ul style="list-style-type: none"> 2...10 times of oc setting OFF(Lc--) 		<ul style="list-style-type: none"> Definite Tripped within 0.5 sec. After elapse of "dt" The decreased proportional % of "Lc" is determined by follow formula, [Max. value of "Lc"=100/"oc" setting value].
Stall	<ul style="list-style-type: none"> 1.5...5 times of oc setting OFF(Sc--) 		<ul style="list-style-type: none"> Definite. Tripped after elapse of preset time("St") More than 11A: Set automatically by proper decreased %. The decreased proportional % of "Sc" is determined by follow formula, [Max. value of "Sc"=100/"oc" setting value]
Operating Time of Stall	Within 0.5sec / 1~10sec.		<ul style="list-style-type: none"> In case of "Sc:OFF", "St" mode becomes OFF automatically
Phase current Unbalance	5...50% / OFF(Ub--)		<ul style="list-style-type: none"> $[(\text{Max curr.} - \text{Min curr.}) / \text{Max}] \times 100[\%] > \text{Ub setting } \%$
Fail Safe	ON(FSon), OFF(FS--)		<ul style="list-style-type: none"> Impossible to set during operation.
Phase Reversal	ON(RPon), OFF(RP--)		<ul style="list-style-type: none"> Tripped 0.1sec.
Phase Loss	ON(PLon), OFF(PL--)		<ul style="list-style-type: none"> Tripped within 3 sec.
Time characteristics for over-current	<ul style="list-style-type: none"> Definite (tcdE) Inverse (tcln) 		<ul style="list-style-type: none"> Definite: Followed by Table #2. Inverse: Followed by Table #3. In case of "oc" setting value is more than 11A, applied for definite characteristics automatically.
Alert	50...100% of oc / OFF(--)		<ul style="list-style-type: none"> OFF (-- in mode): disable.
Type of alert output	A / F / H / U		<ul style="list-style-type: none"> "A"(Ampere relay):energized whenever CT senses current. "F"(Flickering):"A" and current value flashes frequently. "H"(Holding):ON-OFF. "U"(Undercurrent Mode):the "AL" output is transferred into "uc" output.
CT Ratio	OFF-5t,2t, 10-15-20-25-30-40-50-60-75-100- 120-150-200-250-300-400-500-600- 750-800		<ul style="list-style-type: none"> OFF(ct--): wide range (0.5...60A). 5t: Displayed the current more than 0.04A. 2t: Displayed the current more than 0.1A Required to set a current value under 6A based on CT secondary output if need to adopt external CT instead of wide range ["CT":OFF(--)] Refer detail in "oc" mode. Not possible to adjust during the operation.
Trip Cause Memory	Memorized the last 3 trip causes		<ul style="list-style-type: none"> Stored the trip causes, regardless power is off. The stored information is displayed from last trip causes and able to check each phase current when tripped.
Test	Not permitted to test this function during the operation to prevent the unnecessary trip.	 -- (3 sec)  -- (o-time) 	Not possible to test during the operation.

Trip Display

Function	LED Display	Description
Over current		Tripped by over current on L1 phase
Under current		Tripped by under current on L2 phase
Phase Loss		Tripped by L2 phase loss
Phase Reversal		Tripped by Phase reversal
Unbalance		Tripped by unbalance current more than setting % difference in terms of max. phase current on L1 phase [(Max - Min) / Max]x100[%] > setting %
Locked Rotor Trip (starting)		Tripped by Locked Rotor starting
Locked Rotor Trip (working)		Tripped by Locked Rotor working

Specification

Model	TPM-3DE	
Current range	0.5...60 A, wide range (11...960 A with external CT, refer table 1)	
Delay	Delay Time (D-TIME)	1...200 sec. (definite time) / OFF
	Over-current delay Time (O-TIME)	1...30 sec. (definite time, refer table 2) 1...30 Class (inverse time, refer table 3)
	Under-current delay Time (U-TIME)	1...30 sec. (definite time, refer table 2)
	Alert	50...100%, OFF (disable)
Reset	Manual Depressing Reset button or control voltage interruption	
Operation Characteristic	Over-current	<ul style="list-style-type: none"> 0.5...10 A: Definite/ Inverse selectable. More or equal than 11A :definite (If inverse required, use with external CT)
	Under-current	Definite
Tolerance	Current	I < 1 A: ±0.05 A, I ≥ 1 A: ±5%
	Time	t ≤ 3 sec.: ±0.2 sec., t > 3 sec. ±5%
Ambient temperature	Operation	-20° +60° C
	Storage	-30° +80° C
Ambient humidity	30...85% RH without condensation	
Control voltage	220 VAC: ±15%, 50/60 Hz	
Output contacts	Contacts	<ul style="list-style-type: none"> 2-SPDT 3 A / 250 VAC (1 a, 1 b), resistive 1-SPST 3 A / 250 VAC (AL), resistive
	Condition	Normally energized in FS:ON
Insulation	Between casing & circuits	Over 10 MOhms (500 VDC megger)
	Between casing & circuits	2 kV, 50/60 Hz, 1 min.
Dielectric Strength	Between contacts	1 kV, 50/60 Hz, 1 min.
	Between circuits	2 kV, 50/60 Hz, 1 min.
Mounting	35mm Din Rail or Panel	
Power Consumption	Less than 3W	
Electrostatic Discharge	IEC61000-4-2	Level 3: Air Discharge : ±8kV, Contact Discharge: ±6kV
Radiated Electromagnetic Field Disturbance	IEC61000-4-3	Level 3: 10V/m, 150 MHz y 450 MHz portable transceiver
EFT	IEC61000-4-4	Level 3: ±2 kV, 1min
Surge	IEC61000-4-5	Level 3: 1.2×50µs, ±2kV(0°, 90°, 180°, 270°)
1 MHz burst disturbance	IEC61000-4-12	Level 3: 2.5kV, 1MHz
Conducted emission	EN55011	Class B
Approximate average weight	350 g.	